

Storage
Forestry

SD

1
H39

VOL. XIII.

FEBRUARY, 1916

No. 2

Price, 10c. Per Copy; Per Annum, \$1.00; Foreign, \$1.25.

— THE —
Hawaiian Forester
AND
Agriculturist

A MONTHLY MAGAZINE

OF

Forestry, Entomology, Animal Indus-
try, Hydrography and Agriculture

ISSUED UNDER THE DIRECTION

OF THE

BOARD OF COMMISSIONERS OF AGRICULTURE
AND FORESTRY.

PUBLISHED MONTHLY.

Entered as second-class matter at the Post office, at Honolulu, Hawaii.

ADDRESS ALL COMMUNICATIONS TO

DANIEL LOGAN,
EDITOR "THE FORESTER,"

P. O. BOX 366,
HONOLULU, H. T.

For business relating to advertising or subscriptions, address

HAWAIIAN GAZETTE CO., LTD., Publishers,
217 S. KING ST., HONOLULU, HAWAII.

TABLE OF CONTENTS.

	PAGE
Editorial Comments	37
Division of Animal Industry.....	38
Division of Entomology	43
Division of Forestry	46
Forest Conditions Along Volcano Road.....	49
Arbor Day Report.....	52
Division of Hydrography	53
Board Appointments	55
Koa Suitable for Artificial Reforestation (Judd).....	56
A Sidelight on the Maui Forest Trouble (Judd).....	56
Fighting Rabies in Far West.....	58
By Authority	59
Illustration (accompanying article on "Koa").....	57

DIVISION OF FORESTRY.

FOREST AND ORNAMENTAL TREE SEED AND SEEDLINGS FOR SALE AT THE GOVERNMENT NURSERY.

The Division of Forestry keeps constantly on hand at the Government Nursery, seed and seedlings of the important native and introduced trees. These are sold at prices just covering the cost of collection or growing.

The list includes both forest and ornamental trees, such as Silk Oak, Koa, various species of Eucalyptus, Golden and Pink Showers, Pride of India, Poinciana, Albizia, etc. The price of the seed varies from 10 to 50 cents per ounce. The seedlings may be had for 2½ cents each, except a few kinds which are 5 cents. Seed of the various palms is also for sale; the price per 100 varying from \$1.00 to \$2.50. All seed is tested before being sent out, which insures its being good.

All communications in regard to seed or trees should be addressed to David Haugs, Forest Nurseryman, Box 207, Honolulu, Hawaii.

C. S. JUDD,

Superintendent of Forestry.

DIVISION OF ENTOMOLOGY.

To give information about insects free of charge is one of the duties of this Division, and Hawaiian readers are hereby invited to make inquiry in person and by mail. In order to be able to advise intelligently or send the right kind of useful insects for relief, we like and sometimes it is indispensable for us to see the insects suspected or caught in the act, also specimens of the injury. In a tin with a hole or two, or a wooden box specimens may be mailed by parcels post. When specimens are not accompanied by letter always write your name and address in the upper left-hand corner of the package. Address all communications
**SUPERINTENDENT DIVISION OF ENTOMOLOGY, P. O. BOX 207,
HONOLULU, HAWAII.**

EDW. M. EHRHORN,
Superintendent of Entomology.

THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XIII.

FEBRUARY, 1916.

No. 2

EDITORIAL COMMENTS.

Action on the resolution introduced at the annual meeting of the Hawaiian Sugar Planters' Association in December by Hon. L. A. Thurston, chairman of the committee on forestry, should furnish tree planters in the Territory with much valuable data on the proper kinds of trees to plant for water conservation, for the prevention of sand and dust drifting, and for the production of firewood, timber, posts, ties, poles, etc. The information concerning the different values of a great number of trees, contributed by Messrs. David Forbes, L. von Tempsky and C. S. Judd, and printed in the annual report of this committee for 1915, is a good beginning in this study which will further the cause of economic forestry in Hawaii.

The seven-acre experimental eucalyptus plantation, started in Nuuanu valley in 1911 in coöperation with the U. S. forest service, is growing nicely and already promises to show up the comparative values of the eighteen new species of eucalyptus for planting in these islands. In order to make the experiment permanent, the boundaries of each plot of trees, which range from one-third to one-half acre in size, have recently been marked by the Territorial forester with iron pipes and brass tags.

The wonderful success obtained by the newly-adopted cure for sorehead or chicken pox, administered by the Territorial veterinarian to the infected flock of imported black minorca chickens belonging to Mr. H. F. Fisher at Olaa, Hawaii, and to the flock of young sick turkeys of Miss Ladd in Honolulu, should be a great encouragement to poultry raisers whose flocks have suffered from this disease in the past.

Bulbs from Holland, orchids from New Jersey and Australia, wax palms from Singapore, chrysanthemums and peach blossoms from Japan, and ginseng roots from Korea were among the interesting importations which Chief Plant Inspector Ehrhorn examined for injurious insects during November.

The stock-proof fence around the koa grove at 29 Miles on the Volcano road, Hawaii, which was completed in December,

will insure the preservation of this interesting territorial forest reserve. One of the largest koa trees in the islands, within this reserve, is among the incidental points of interest viewed by visitors to the volcano of Kilauea.

The 31 inches of rain which fell in upper Nuuanu during November was the heaviest monthly rainfall recorded since the rain gauge was established in 1911, and assures Honolulu of a sufficient water supply for some months to come.

The reappearance of hog cholera on Oahu in November confirms the wisdom of the Board in passing, several years ago, Rule VII of the Division of Animal Industry which forbids the shipment of hogs from Oahu piggeries to any of the other islands.

The idea that there is a considerable amount of accessible awa root growing in the forest reserves is rapidly being dispelled. The holder of permits for gathering awa root in the Puna and Hamakua Pali forest reserves on Hawaii is having a hard time in locating much, if any, of this commodity.

Each of the 1350 school children who called at the government nursery on Arbor Day and took away a tree for planting, should have been impressed with the lesson of the value of trees at least for ornamental purposes.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, December 30, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit as follows my report for the Division of Animal Industry for the month of November, 1915:

Hog Cholera.

This disease has again made its appearance in Honolulu and vicinity, beginning in Kalihi in a small piggery, where the disease has never been known before. From there it spread to Wahiawa, by the transfer of infected pigs, and a number of animals were lost. By the prompt application of serum the Wahiawa outbreak was checked, but, without any traceable means of transmission, the disease appeared in a large piggery in Kuliouou and in a smaller one at Puuloa. As the available serum supply became exhausted a number of hogs were lost at Puuloa, even though most of the animals had previously been serum treated. The same applies to the Kuliouou outbreak, where serum fortunately was on hand and serious losses were prevented by prompt appli-

cation. There, for the first time, the double or serum-virus treatment was tried, one of the sickest pigs being bled by cutting off the tail, and the blood injected simultaneously with the serum. Every precaution was taken to prevent the further spread of the disease, and it may be said that at the present writing the outbreak is under complete control. A large supply of serum was cabled for and arrived in record time, and the total losses of hogs were undoubtedly limited to less than ten per cent of what they would have been if the serum treatment had not been known.

The source of infection remains unknown. No hogs were imported from abroad and no herds were known to be infected at the time. The outbreak must, therefore, be ascribed to either a recrudescence of dormant virus on the respective premises where the disease appeared, or to so-called "carriers."

The simultaneous appearance of *chicken cholera*, a disease of poultry almost identical with hog cholera and by some authors considered even transmissible from hogs to poultry and vice versa, speaks for the recrudescence theory. This disease, chicken cholera, appeared among a shipment of muscovy ducks from Mokapu and consigned to the territorial marketing division. Prompt treatment with intestinal disinfectants—sulphate of iron—and thorough disinfection in connection with the segregation of the infected and exposed birds, seems to have effectively checked the outbreak by this time.

Sore-head or Chicken Pox.

The statement in my September report to the effect that sore-head in poultry could be successfully treated by means of a vaccine made from the crusts or cores removed from the heads of affected birds appeared to have been welcome to a number of chicken raisers. Mr. H. F. Fisher of Olaa, Hawaii, responded immediately by sending a small bottle full of such crusts removed from the combs and wattles of more than 200 imported black minorcas. Sore-head, or chicken pox, had made its appearance among these fine birds with disastrous results, nearly one-third having died at the time the information reached him that the disease could be treated successfully.

When the material forwarded was received, the vaccine was immediately prepared and, with the Board's approval, the writer left the following day for Hilo in order to make personal observations on the effect of the treatment.

As stated nearly one-third of more than 300 head of black minorcas had already died, and very few of the remaining birds were unaffected when the writer arrived with the vaccine.

As a special paper is being prepared on this subject, it is unnecessary here to go into detail about the preparation and application of the vaccine. Suffice it to say that upon the writer's

arrival practically all of the birds were more or less affected, and a dozen or so were in a moribund condition. All the birds were injected and the local lesions treated with tincture of iodine, the injection being repeated on the fifth day. Marked improvement was noticed as early as the second day after the first injection and complete recovery resulted in the course of one to two weeks in practically every case, even four of the dying ones making a complete though slower recovery. There was but slight constitutional reaction to the treatment, some of the birds being temporarily dejected and a few developing diarrhea which was easily checked by means of sulphate of iron in the drinking water.

Without question the treatment in this case proved an unqualified success, some of the recoveries being quite remarkable.

An outbreak of a far more virulent form in a flock of young turkeys is now under treatment in Nuuanu valley in Honolulu. The vaccine treatment was applied without delay and it may safely be said that without it there would not be a turkey left alive today in the infected flock. As it is, only one bird has been lost so far, and nearly all the remaining ones are well on the way to recovery. The bird that died became blind in both eyes, from the tumors invading the eye sockets, and probably starved to death from being unable to find its food. It was very weak at the time of the first treatment, but, though the eyelids were affected, it was not expected that the lesions would so rapidly invade the sockets as to completely destroy the eyesight. Consequently no instructions were left with the caretaker in regard to special care of the bird, and it was lost.

A number of the remaining ones are, however, encouraging illustrations of the most marvellous effectiveness of this modern *similia similibus* treatment which, as stated, consists in the injection, hypodermically, of a solution made from the crusts of the sores that form on the heads of the affected birds. This solution, which would cause a fatal attack of the disease in a healthy bird in a few days after injection, if used in its original strength, is attenuated by heating for one hour to a temperature of 137° F. The heating so reduces the virulence of the infection that its introduction into a healthy bird produces a hardly noticeable attack of the disease, but one which confers permanent immunity against future attacks. At the same time, but for less obvious reasons, it seems to have a strong curative effect on already affected birds.

While but few opportunities have so far presented themselves for experimentation, the fact has been established that birds so badly affected that further treatment seemed useless, have, after the first injection, entered upon a straight road to recovery that is almost unbelievable, and, while sore-head or chicken pox may seem an insignificant disease and of small economic importance, the overwhelming significance of these recoveries, as a promise

of success in the application of this method to other diseases, should not be lost sight of. The importance of this so-called "autogenous" treatment was first brought out two or three years ago when it was heralded as a "cure-all," and naturally soon became discredited. Pneumonia, gonorrhea, pyemia and numerous other specific or non-specific infective diseases were reported cured after but one or two successful experiments with the application of either heated or filtered virus or virulent discharges, but the unreported, unsuccessful cases soon became numerous enough to assert themselves. In veterinary medicine, however, where herds or flocks rather than the individual were experimented with, the method continued and gained in favor, and the sore-head or chicken-pox vaccine is the first staple result of these experiments and one which promises new life to the poultry industry. The publicity given to the Hawaii experiment has brought forward the fact that numerous people have quit the raising or even keeping of poultry solely on account of this disease, and that they would willingly take it up again if there was any way of protecting their birds against sore-head. It is, therefore, to be hoped that the experiment now under way will prove successful, as the disease we are now dealing with is of the most virulent type and the birds, young turkeys, are recognized as the most delicate and difficult birds to raise, and if a satisfactory percentage of the flock can be saved and the method of treatment simplified to a point where any intelligent individual can prepare and apply it, a special circular will be prepared, setting forth the essentials of the method, and distributed among present and prospective poultry raisers.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Dec. 17, 1915.

Dr. Victor A. Nörgaard,
Chief of Division of Animal Industry.

Sir:—I beg to submit the following report for the month of November, 1915:

Tuberculosis Control.

The following dairy cattle received the tuberculin test:

	Tested	Passed	Condemned
F. S. Lyman.....	34	34	0
Boys' Industrial School.....	48	48	0
Aubrey Hotel	1	1	0
Laie Plantation	27	24	3
J. F. Borres.....	11	10	1
Y. Ozawa	9	9	0
Dr. Straub	27	27	0
J. H. Cummings.....	1	1	0

A total of 158 head of dairy cattle were tested during the month, out of which number 154 were passed and tagged and 4 condemned and branded. One of the above condemned cows has already been slaughtered.

Post-mortem examination was made at one of the local abattoirs on five cows recently condemned in one of the local dairies. All presented lesions of tuberculosis.

Following your suggestion to ascertain the effect, if any, of a subcutaneous injection of tuberculin on the intradermal method of testing, an experiment was started, the results of which are as follows:

In this experiment nine cows were used. These cows had been condemned in one of the local dairies on October 8, and had been kept segregated ever since. These cows were first given the regular subcutaneous injection of 2 cc. of tuberculin followed by an intradermal injection into the lower eyelid of four drops of special tuberculin.

An examination was made 24 hours after the injection and every animal was showing a distinct reaction to the intradermal test. Forty-eight hours after injection the swelling was still persistent in six, but much reduced in size, and had entirely disappeared in three. Seventy-two hours after injection all local reactions had disappeared. Three of the above animals showed a marked constitutional reaction twenty-four hours after receiving the double injection.

While the above experiment is far too small for formulating any definite conclusions, still the results seem to indicate that a subcutaneous injection of tuberculin does not in any way obscure the local reaction to the intradermal test, but tends to hasten its appearance.

Importations of Live Stock.

S. S. Manoa, San Francisco: 1 Berkshire boar, Cornwell Ranch; 2 Shropshire rams, K. S. Kahului; 23 cts. poultry.

S. S. Hyades, Seattle: 2 Hampshire hogs, 2 Berkshire hogs, Maui Agricultural Co.

S. S. Matsonia, San Francisco: 1 ct. doves, 2 cts. pigeons, 4 cts. chickens, 1 dog, Wells Fargo Express Co.; 32 cts. poultry.

S. S. Lurline, San Francisco: 3 horses, U. P. Transfer Co.; 1 ct. monkey, Wells Fargo Ex. Co.; 1 bull (Durham), W. E. Bellina; 28 cts. poultry.

S. S. Sonoma, San Francisco: 1 dog, E. C. Zitkowski; 1 dog, S. Ozaki; 1 turkey, J. Jurgensen.

S. S. Wilhelmina, San Francisco: 3 dogs, B. F. Rivenburgh; 1 dog, O. B. Shipman; 1 monkey, G. S. Raymond; 36 cts. poultry.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, December 10, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of November, 1915, as follows:

During the month 37 vessels arrived at the port of Honolulu, of which 18 carried vegetable matter and one vessel moulding sand. Owing to the blockade of the Panama canal only one vessel passed through the same for this port.

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	1398	37,941
Fumigated	23	39
Burned	56	57
Returned	4	6
Total inspected.....	1481	38,043

Of these shipments 37,619 packages arrived as freight, 195 packages as mail matter and 229 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 21,993 bags of Japanese rice and 1949 bags of Japanese beans arrived by various steamers, all of which were found free from pests and were passed for entry.

Pests Intercepted.

Thirty-five packages of fruit and 14 packages of vegetables were taken from passengers and immigrants coming from foreign countries and were destroyed by burning.

One lot of ornamental plants arriving on November 1 was found infested with scale (*Phonacaspis eugeniae*) and the lot was fumigated before delivery.

One box of bulbs from Holland was found infested with ants (*Pronolepis longicornis*) and was fumigated with carbon bisulphide before delivery.

One box of orchids from New Jersey, arriving on November 10, was fumigated, as a few plants were found infested with two common orchid scale insects (*Diaspis bois duvalii* and *Aspidiotus Cyanophyllis*).

On November 17 a package of peas from Japan infested with *Bruchus chinensis* was fumigated with carbon bisulphide. Three cases of plants arrived from Singapore on November 29 consisting of two cases wax palms and 1 case *Mussaenda erythrophyllis* which were fumigated and all soil removed from the roots. In the soil were found two species of ants (*Prenolepis* and *Monomorium*), the grubs of an *Elaterid* beetle, several cockroaches (*Leucophala surinamensis*) and several millipeds. On the *Mussaenda* plants was found a mealy bug (*Pseudococcus* species close to *P. citri*). All plants were repotted in sterilized soil so as not to suffer from our treatment. A package of cut flowers consisting of chrysanthemums and peach blossoms brought by a Japanese passenger on November 29 was destroyed.

The chrysanthemums were infested by a fungus forming swellings on the stems. The peach twigs were infested by the white peach scale (*Aulacaspis pentagona*). There was also a cluster of moth eggs on one twig and a small bag worm case attached to another. A small package of chestnuts found in the baggage of an immigrant was burnt on account of being infested with a weevil, probably a *Balaninus* species.

One package of ginseng roots from Korea, two orchids from Australia and a package of eucalyptus seed from China were refused entry into the Territory under rulings of the federal horticultural board.

One box of beneficial insects arrived on November 6 from Mr. F. Muir in my care. This was thoroughly inspected at the Planters' station and all soil and packing were destroyed by burning.

Beneficial Insects.

During the month of November the following parasites of fruit flies have been bred:

<i>Tetrastichus giffardii</i>	16,500
<i>Diachasma fullawayi</i>	925
<i>Diachasma tryoni</i>	639
Total bred	<u>18,064</u>

Including the usual number of parasites of the horn, house and stable fly bred during the month, the following parasites were liberated in various sections:

Tetrastichus giffardii	14,700
Diachasma fullawayi	867
Diachasma tryoni	613
African Spalangia	1,400
Philippine Spalangia	1,200
African Horn Fly	1,400
Galesus silvestrii	250
Philippine Ptoromalid	1,300
<hr/>	
Total distributed	21,730
<hr/>	

The breeding of the mealy bug parasite (*Paraloptomastix abnormis*) has been continued, but no liberations were made.

Hilo Inspection.

During the month of November Brother Matthias Newell reports the arrival of six steamers, of which five brought vegetable matter consisting of 223 lots and 3904 packages. All these shipments were found free from pests and were allowed to enter the port.

Inter-Island Inspection.

During the month 64 steamers plying between Honolulu and the other islands were attended to. The following shipments were passed:

Taro	503 bags
Plants	282 boxes
Fruit	32 packages
Vegetables	46 packages
<hr/>	
Total inspected and passed	863 packages
<hr/>	

The following packages were refused shipment on account of infestation and of having undesirable soil attached to the plants:

Plants	14 packages
Fruit	32 packages
<hr/>	
Total refused shipment	46 packages
<hr/>	

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, December 21, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit the following routine report of the Division of Forestry for the month of November, 1915:

Forest Fencing.

The forest fence along the boundaries of the Kealia and Mo-loaa forest reserves on Kauai at Anahola and Aliomanu is nearing completion and Forest Ranger Lovell reports that at the end of November 9980 feet of the fence had been constructed.

On November 8 the agreement with Mr. A. J. W. MacKenzie for the construction of the hog-proof fence around Section B of the Olaa Forest Park reserve at 29 Miles on the Volcano road, Hawaii, was executed and, on November 15, the construction of this fence begun.

On November 30 I went over the forest fence on the makai boundary of the Lualualei forest reserve at Waianae and found that it was in need of repair in several places. I am arranging for this work and as soon as the fence is once more cattle-proof I shall have it kept so by Forest Ranger John Pililaau, who began his work in this region on December 1.

Nuuanu Eucalyptus Plantation.

A previous inspection of the experimental plantation of eighteen different new varieties of eucalyptus trees established by my predecessor in Nuuanu valley with federal funds in coöperation with the United States forest service, showed that many of the smaller trees were being choked with the rank Hilo grass. I accordingly employed a laborer for 13 days to clear the grass from around the smaller trees so that now they will have a better chance for growth. The plantation as a whole is doing remarkably well and in a few years valuable data as to these new species of eucalyptus will be available. Since I also found that the corner stakes of hau sticks had not sprouted in most cases, I replaced these with permanent ½-inch galvanized iron pipes, which were placed at appropriate corners and marked with the number of the plot stamped on brass tags.

Forest Reserve Matters.

On November 15 Forest Ranger E. H. Hipple began his work of taking care of the Honolulu Watershed forest reserve lands in Palolo, Manoa and Nuuanu valleys.

Mr. C. M. Hudson of Hilo reported early in the month that

he had as yet been unable to locate any awa root in the Puna forest reserve, Hawaii, being hindered in his search by the heavy rains. As you will recollect, I was authorized to issue him a permit, on September 25, to gather two tons of awa in this reserve during a period of sixty days. Mr. Hudson paid \$100 for the awa. Upon the advice of the president of the Board, I extended the time of this permit thirty days.

On November 26 I made a trip to Waimalu valley, Oahu, to locate a small piece of government land called Waholoa in the Ewa forest reserve.

On November 30 I visited the Waianae-kai forest reserve and served notice on Mr. Thos. Makia to move his fence, as instructed by the Board on November 4. On this trip I also instructed Mr. John Pililaau as to his duties as forest ranger for the Waianae district.

Coöperation With H. S. P. A.

During the latter part of the month I completed and forwarded to Mr. L. A. Thurston, chairman of the committee on forestry of the Hawaiian Sugar Planters' Association, a discussion of the native and introduced trees suitable for each of the four following purposes:

1. The conservation of water and protection of watersheds.
2. The protection of lands from destruction by wind and by drifting sand and earth.
3. The production of firewood.
4. The production of timber.

Hilo Sub-Nursery.

In order to provide for more extensive work at the Hilo sub-nursery, from which a large part of the island of Hawaii is supplied with forest trees, the monthly allowance to Bro. Matthias Newell for the upkeep of this nursery was on November 1 increased from \$15.00 to \$30.00.

Arbor Day.

Arbor Day was celebrated on November 19, the day proclaimed for this purpose by Governor Pinkham, as shown in the accompanying special report of the forest nurseryman. The celebration of this day was more than usually successful. In all 20,583 trees were given out from the government nursery for planting, and school children to the number of 1350 called at the government nursery and each took away one tree for planting on school grounds. At the request of the Outdoor Circle, I delivered a

short address on trees at the Arbor Day celebration of the Puhukaina school in Kakaako.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, December 15, 1915.

Superintendent of Forestry,
Board of Agriculture and Forestry.

Dear Sir:—The following report gives the principal work done during the month of November:

Nursery.

Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot Grown	Total
Sold	50	162	212
Gratis	2000	300	460	2760
	<u>2000</u>	<u>350</u>	<u>622</u>	<u>2972</u>
	<u><u>2000</u></u>	<u><u>350</u></u>	<u><u>622</u></u>	<u><u>2972</u></u>

Collections.

Collections on account of plants sold amounted to.....\$ 4.50
Rent of building, nursery grounds, July, Aug., Sept., Oct. 140.00

Total\$144.50

Arbor Day.

The shipping and distribution of trees for Arbor Day planting and other work connected with Arbor Day has taken up most of our time during the month. As will be seen by the special report, handed to you a few days ago, the number of trees distributed for Arbor Day was the largest we have yet had, amounting to 20,583.

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 12,000 in seed boxes and 600 in transplant boxes.

Makiki Station.

Owing to the great demand for trees during the past two months our stock at this station, as well as at the main nursery, is considerably reduced. Our supply of some of the species which we try always to have in stock is entirely exhausted. For the next few months our efforts will be directed toward the building up of our stock again.

Honolulu Watershed Planting.

The work done during the month has been clearing away the grass and weeds from the young trees. This work is now about finished and we intend to commence planting again in December.

Advice and Assistance.

The writer has made calls and otherwise given advice and assistance as follows at the request of people residing in and around the city:

At the request of officials calls were made at Fort Kamehameha and Pearl Harbor.

Visits to places in the city, 9; requests for advice by telephone, 15; requests for advice at the nursery, 19; requests for advice by letter, 6; total, 49.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

FOREST CONDITIONS ALONG VOLCANO ROAD.

Honolulu, December 29, 1915.

Board of Commissioners of Agriculture and Forestry,
Honolulu, T. H.

Gentlemen:—I beg to present herewith a special report on the forest conditions along the Volcano Road, Hawaii.

Olaa Forest Park Reserve.

This forest reserve was created on August 20, 1914, and consists of three sections, A, B and C, between 20 Miles and 18 Miles on the Volcano road.

Section B.

This part of the Olaa Forest Park reserve is at 29 Miles and contains 7.32 acres. It consists of the koa grove which was

reserved out of the Olaa summer lots, and is now one of the attractions to tourists who visit the volcano, on account of the natural grove of koa trees, which is about the only one in this immediate vicinity, on account of the beautiful tree ferns, and in particular on account of an immense koa tree of peculiar growth.

Under authority previously granted me by the Board, I have had this section of the Olaa Forest Park reserve enclosed with a Page woven-wire, 13 bar, hog-proof fence. The construction of this fence was completed on December 9 so that now the section is absolutely protected from all stock. The fence was satisfactorily constructed by the contractor, Mr. A. J. W. MacKenzie. The total cost of the fence was \$260.27, of which the Bernice P. Bishop Estate paid \$39.40 as their share of half the cost of the fence along the Keauhou boundary.

Section A.

This part of the Olaa Forest Park reserve consists of 374 acres of a splendid ohia lehua and tree fern forest at 24 Miles. Here is situated the most interesting native forest on the drive from Glenwood to the volcano, and it is well worth preserving in its natural condition. Cattle from the dairies in the region of Glenwood are beginning to work in to the edges of this reserve, and unless it is soon protected by fencing the forest will begin to die back. In order to preserve this forest, therefore, it is necessary that its boundaries be fenced immediately. The government surveyor has recently had the boundary lines re-run, brushed out and flagged preparatory to the construction of a fence. The total distance of the boundaries of the four pieces of land in this reserve is approximately 29,641 feet or about 5.62 miles.

Attached herewith are specifications for a proposed fence around the boundaries of Section A of the Olaa Forest Park reserve, and, if they are acceptable to the Board, I recommend that I be authorized to advertise for bids for the construction of this fence and proceed with the work. The Board already has a sufficient quantity of durable wire for this fence, and, since the posts will be cut locally, practically the only cost will be for the labor of cutting and setting the posts and stringing the wire. In order to guarantee efficient work on this job, I propose to require the successful bidder to furnish a satisfactory bond with the contract.

Section C.

This part of the Olaa Forest Park reserve consists of 56 separate pieces of land in the form of strips 150 feet wide and from 150 feet to 2000 feet long along both sides of the Volcano road between 18 Miles and about 23½ Miles. These strips were reserved out of the Olaa lots which were sold by the government

some time ago, the idea being to preserve as a park this fringe of forest along both sides of the main Volcano road. The idea was good but the strips, only 150 feet wide, were too narrow to allow the forest to maintain its integrity in opposition to the land clearing on private property just back of these strips. The strips themselves were not fenced to keep out cattle and owing to the adjacent clearing and to marauding stock, the result now is that most of these forest strips consist of dead trees with a scrubby undergrowth of ferns and Hilo grass. This is particularly true of the strips consisting of 41 separate pieces of land between 18 Miles and Glenwood, which is at the 22-Mile post. If the land back of these strips on this section were government land there would be some chance perhaps to reclaim this dead and dying forest, but under present conditions, with the cattle from the numerous dairies in this region wandering promiscuously about, I see no use of going to the great expense of fencing these 41 pieces of land containing mostly dead forests. Moreover, an application has recently been received from the land commissioner for the release from Section C of the Olaa Forest Park reserve of the denuded strips adjacent to 7 of the Olaa lots situated between 18 Miles and 22 Miles, so that they can be sold to the owners of the adjacent lots.

I wish to recommend, therefore, that the appropriate steps be taken to eliminate from Section C of the Olaa Forest Park reserve the 37 pieces of land consisting of strips 150 feet wide and from 150 feet to 2000 feet long on each side of the Volcano road between 18 Miles and 22 Miles. I suggest that the matter of this elimination first be laid before the Hilo board of trade before final action is taken by this Board.

Between Glenwood, at 22 Miles, and Section A of the Olaa Forest Park reserve at 23½ Miles the forest on the 15 strips of reserved forest land has not been damaged to such an extent but that it can be reclaimed by protective fencing. In my judgment this part of Section C of the Olaa Forest Park reserve should be retained and properly fenced as soon as the opportunity presents itself.

In a word, it seems to me that the policy of the Board in connection with the forest reserves in this region should be to fence the reserved forests where the forest is still in a healthy condition and give them absolute protection, and release for disposition by the land commissioner the reserved strips on which the forest is dead or in such a dying condition that it cannot be reclaimed except at an enormous cost.

Proposed New Forest Reserve at Waiakea.

While on my recent trip in this region the deputy territorial veterinarian for Hawaii pointed out to me the forest on an old lava flow along the Volcano road between about 4½ Miles and

the Puna boundary at about 7 Miles. This is the first forest of ohia lehua, kukui and other native trees which the tourist sees after leaving Hilo for the volcano, and it is a forest region well worth protecting for its scenic value. The forest is in a fairly healthy condition and where a fire swept over it some years ago the young ohia trees are coming in, in a healthy and satisfactory condition. The forest is situated on land which is too rocky for any agricultural use with the possible exception of raising awa root. There should, therefore, be no objection to including this land in a forest reserve, subject, of course, to the expiration of the Waiakea lease, which expires on June 1, 1918. I have talked over this proposed forest reserve with the land commissioner and he is favorable to its creation. If the Board also looks with favor on this proposed reserve, I shall proceed to obtain a description of it and submit a more detailed report preparatory to the usual process of creating it as a forest reserve.

Respectfully submitted,

C. S. JUDD,
Superintendent of Forestry.

ARBOR DAY REPORT.

Honolulu, November 30, 1915.

Superintendent of Forestry, Board of Agriculture and Forestry.

Dear Sir:—I herewith submit a special report on the distribution of trees for Arbor Day. The planting of trees on Arbor Day is attracting more attention each year. The total distribution of plants for Arbor Day planting this year amounted to 20,583, all of which, with very few exceptions, were pot grown trees. For 1914 the total distribution for Arbor Day was 17,595, the increase for 1915 being 2998. The number of trees distributed to homesteaders on Kauai and Maui is much larger this year than last year. The total distribution to the schools is also about 1200 more than in 1914.

The following tables show how the trees were distributed:

Distribution by Islands.

	Trees
Oahu—Outside Honolulu—homesteaders and others.....	3,426
Military posts	1,600
Honolulu and neighborhood.....	4,676
School children on Arbor Day, 1 tree each.....	1,350
Total for Oahu.....	11,052

Total for Hawaii.....	1,252
Total for Maui.....	3,048
Total for Kauai.....	3,129
Total for Molokai.....	68
	<hr/>
	18,549

Schools.

Oahu—Outside Honolulu.....	3 schools.....	40
Honolulu and neighborhood....	20 “	567
Hawaii	2 “	67
Kauai	3 “	235
Maui	13 “	1,101
Molokai	1 “	24
	<hr/>	<hr/>
Total	42 “	2,034

Summary of Plants Distributed.

Oahu (including Honolulu).....	11,052
Hawaii	1,252
Kauai	3,129
Maui	3,048
Molokai	68
Schools on all islands.....	2,034
	<hr/>
Grand total	20,583

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, December 4, 1915.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during November, 1915, is submitted:

Weather Conditions.

The rainfall was excessive generally over all islands. During the week ending November 13, the rainfall was particularly heavy over the entire group. The Nuuanu Pali rain gauge registered about 31 inches for the month, the heaviest monthly rainfall recorded since the register was established in 1911. On Kauai the streams and ditches were all above normal during the entire

month, but no excessive floods occurred. Large floods occurred on Oahu, Maui and Hawaii, and on Hawaii considerable damage was done by high winds and floods.

Special Reports.

A special report relative to the amounts diverted under each territorial land lease and water license on East Maui, was prepared and furnished the Governor of Hawaii, at his request. The data contained therein are to be used in determining the rentals to be assessed under these leases and licenses in the future. Copies of this report are attached hereto.

From November 17 to 20 was spent on the island of Kauai inspecting new construction work and gathering records and evidence as to the mean daily and annual flow of ditches diverting territorial waters from the Waimea, Anahola, Kapaa and North Wailua rivers.

These records are now being analyzed and computed and, when in proper form, will be incorporated in a report to the governor to assist him and the commissioner of lands in determining the future water values of these streams.

One copy each of the topographic maps of Kauai and Oahu has been colored to show information relative to military reserves, hydrographic data, homesteads, forest reserves, etc., at the request of the governor. One copy of the map of Oahu has also been similarly prepared for the Division of Forestry.

New Construction.

Kauai. Very little was accomplished during the month on account of high water in the streams which prevented all excavation work.

Oahu. Two new reinforced concrete weirs were established on the upper reaches of the middle and east branches of the Ma-laekahana streams near Kahuku. These stations will measure the flood flow of these streams in connection with a possible billion-gallon storage project near Kahuku. These weirs will replace those originally established at the expense of the Kahuku plantation in 1914, which were damaged by heavy floods. The plantation paid about one-half of the cost of the new construction work.

Routine Operation and Maintenance Work.

Kauai. No trail repair work was possible on account of steady rains.

D. E. Horner and the Japanese laborer who were injured on October 28 returned to work on November 10 and 12.

Twenty stream and ditch measurements were made and 20

stream and ditch measurement stations were visited. Sixteen days were spent by Mr. Hardy and Mr. Horner on computations and office work.

Oahu. Measurements made the latter part of the month on the Waiahole tunnel project showed about 13 million gallons per day flowing from the north portal, and about 6 million gallons per day from the south portal. Twenty-eight stream and ditch measurements at regular stations, and two miscellaneous measurements were made. Three rainfall stations and 44 stream and ditch measurement stations were visited and inspected.

Maui. But one stream measurement was made and one rain measurement station visited. All continuous record stream measurement stations were inspected.

Molokai and Hawaii. The usual rainfall records were received from coöperative observers.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

BOARD APPOINTMENTS.

Commissions were issued by the Board of Agriculture and Forestry during the year 1915 to the following:

January 16—C. S. Judd, Superintendent of Forestry.

April 28—C. S. Judd, Executive Officer.

April 28—John S. Goodell, District Fire Warden, District of Koolau, Maui, east of Makapipi Gulch.

April 29—Frederick Muir, Field Entomologist.

May 1—Kaina D. Lovell, Forest Ranger, Kauai.

July 1—David T. Fullaway, Field Entomologist in Charge of the Expedition to India.

October 7—Herbert T. Osborn, Field Entomologist for the Collection of Beneficial Insects.

October 13—Dr. H. B. Elliot, Deputy Territorial Veterinarian for the Island of Hawaii.

November 15—E. H. Hipple, Forest Ranger for Palolo, Ma-noa and Nuuanu Valleys in the Honolulu Watershed Forest Reserve.

December 1—John Pililaau, Forest Ranger for Waianae, Oahu.

KOA SUITABLE FOR ARTIFICIAL REFORESTATION.

By C. S. JUDD, *Superintendent of Forestry.*

That our native koa (*Acacia koa*) is very suitable for artificially reforesting our denuded slopes has been proved by the planting operations of the Division of Forestry on the Honolulu Watershed forest reserve which were begun in November, 1913. The accompanying illustration shows one of the koa trees which, although slightly over two years old, is already fourteen feet high and four inches in diameter at the base. Koa trees were planted on the upper slopes of the Makiki valleys fifteen by fifteen feet apart and already on Sugar Loaf the growth has been so rapid that before very long a solid forest canopy will be established.

On the lower slopes and in the valleys kukui trees were planted and these too are showing up very well. Before long, all of this part of Honolulu's source of water supply will consequently receive better protection by this reestablished forest. Both koa and kukui are easy to raise from seed and easily handled in planting operations.

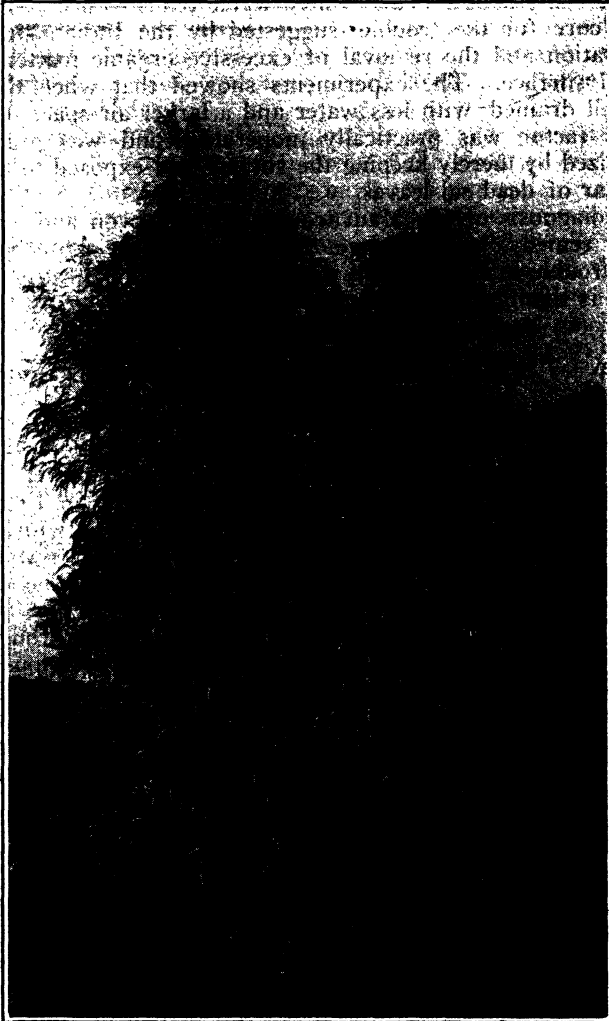
A SIDELIGHT ON THE MAUI FOREST TROUBLE.

By C. S. JUDD, *Superintendent of Forestry.*

The death of native trees in the Koolau forests on Maui, which began in 1906, was ascribed by Mr. H. M. Curran primarily to heavy winds, acting on the forest, the normal vigor of which had, by adverse soil conditions, excessive moisture, and the opening of the forest by grazing and ditch construction, been reduced to a point where it was unable to withstand any further increase of unfavorable conditions.

The trouble was determined by Dr. H. L. Lyon to be due directly to chemically active agents in the soil which killed the roots which penetrated the soil to a depth of two inches or more. The trees that were thus killed were located mostly on the flat ridges where the drainage was poor and where there was an abundance of standing water. Every variety of tree in the affected area succumbed to the attack.

A sidelight on this trouble comes from the other side of the globe and is described in the *Indian Forester* of October, 1915. In Northern India there has been a widespread death of the seedlings of sal, *Shorea robusta*, the most extensively used timber tree of that region. Studies made at Dehra Dun of the trouble, which comes into operation in the rainy season, especially in the months of July and August, have ascribed the cause to "an injurious soil factor" produced by lack of sufficient oxygen for root-respiration combined with the presence of toxic substances in the soil which are directly poisonous to the roots. The cause



Two-year old koa tree on Sugar Loaf, Honolulu Watershed Forest Reserve. Height, 14 feet, Diam., 4 in.

of the former is bad drainage and the latter are probably produced as a result of the decomposition of the organic matter in the soil.

The "injurious factor" tends to exert itself during the rains and especially in low places where water tends to accumulate.

The cure for the trouble; suggested by the Indian study, is soil-aeration and the removal of excessive organic matter from the soil surface. The experiments showed that when the soil was well drained, with less water and a larger air-space, the injurious factor was practically inoperative and was gradually neutralized by merely keeping the surface soil exposed to the air and clear of dead sal leaves.

The diagnosis of the Maui trouble by Mr. Lyon and his prescribed remedy, soil drainage, are so similar to those relating to the trouble in India that it would appear that the cause of the trouble is significantly the same.

FIGHTING RABIES IN FAR WEST.

(The following article, furnished by the U. S. forest service, was received just too late to be printed, in connection with the editorial reference to precautions against rabies here, in the January number. Under date of January 14 a San Francisco despatch reports the danger from coyotes infected with rabies as having become acute in California, with the beasts attacking farmers and school children, and schools having to be closed, in counties bordering upon Oregon and Nevada.)

The Department of Agriculture is taking action, through the biological survey and the forest service, to combat a serious wave of rabies infection of wild and domestic animals that is in danger of becoming widespread in the far West. The fact that the extensive dissemination of the disease is taking place through the agency of coyotes makes the situation a difficult one to meet.

Outbreaks of rabies among coyotes have been noted from time to time for several years in parts of Washington, Oregon and northern Idaho, and the forest service undertook last year to aid in bringing the disease under control by employing hunters to make war on coyotes in the national forests of some infected localities. Since, however, the coyotes breed in the foothills and around the outskirts of the forests, a more comprehensive campaign is called for.

The eradication of coyotes in sparsely settled or rough country is said to be an exceedingly difficult task. Inasmuch as these animals are always a source of considerable losses to the live-stock industry of the West, Congress last year provided a special fund of \$125,000 to be spent by the biological survey for the eradication of predatory animals both in the national forests and on the public domain, and from this fund a special allotment has now been made to provide for fighting the rabies.

The disease first appeared in parts of eastern Oregon and Washington and northern Idaho, in a region surrounded by natural barriers which tended to confine the outbreak. Domestic animals and human beings were bitten, and a good deal of alarm was manifested by residents of the infected districts, many of whom feared for the safety of their children on the roads to and from school. The disease is now reported as having extended into northern Nevada and northern California, whence it may easily be carried far.

The forest service, the biological survey and the state board of health are working together to meet the situation in California. Modoc and Lassen counties have been put under quarantine by the state board, which has appointed forest rangers inspectors in Modoc county. Funds have been provided by the biological survey for the employment of additional men and the purchase of traps and poison. The public will be enlisted in the campaign, which will be led by the biological survey officials and the forest rangers.

BY AUTHORITY.

BIDS FOR FOREST FENCING.

Sealed bids marked outside "Bids for Forest Fencing, Olaa, Hawaii," and addressed to the Superintendent of Forestry, P. O. Box 207, Honolulu, Hawaii, for the construction of a stock-proof fence around Section A of the Olaa Forest Park Reserve at 24 Miles on the Volcano Road, Puna, Hawaii, will be received up to and including January 29, 1916. Bids to be submitted in a lump sum for the job as a whole, and to be accompanied by a certified check, payable to the undersigned, for a sum equal to 5 per cent of the amount bid. The right is reserved to reject any or all bids. Specifications may be obtained on application from the undersigned.

C. S. JUDD,
Superintendent of Forestry, and Executive Officer,
Board of Agriculture and Forestry.
Honolulu, Hawaii, January 7, 1916.

**TERRITORY OF HAWAII
BOARD OF AGRICULTURE AND FORESTRY
DIVISION OF FORESTRY**

**INFORMATION CONCERNING PROPOSED FENCING OF THE OLAA
FOREST PARK RESERVE, SECTION A, PUNA, HAWAII.**

Bids marked outside "Bids for Forest Fencing, Olaa, Hawaii," and addressed to the Superintendent of Forestry, P. O. Box 207, Honolulu, Hawaii, will be received for the construction of a stock-proof fence around this reserve, up to and including January 29, 1916.

The total length of the fence, which is to be stock-proof and constructed according to the attached specifications, is 29,641 feet, more or less.

The location of this proposed fence is shown by the yellow lines on the enclosed blue print map. The location of this fence on the ground has recently been surveyed and the lines brushed out and distinctly flagged.

Bids should be submitted in a lump sum for the work as a whole. Bids must be accompanied by a certified check for a sum equal to 5 per cent. of the amount bid, payable at sight to the undersigned.

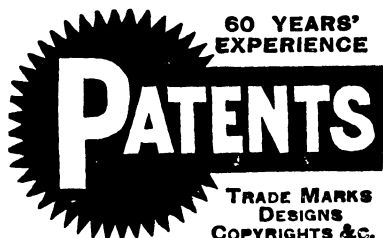
The right to reject any or all bids is reserved.

The successful bidder will be required to furnish with the contract a satisfactory bond in an amount equal to 25 per cent. of the accepted bid.

C. S. JUDD,

Superintendent of Forestry, and Executive Officer,
Board of Agriculture and Forestry.

Honolulu, Hawaii, January 7, 1916.



TRADE MARKS
DESIGNS
COPYRIGHTS &C.

Anyone sending a sketch and description may quickly ascertain our opinion free whether an invention is probably patentable. Communications strictly confidential. **HANDBOOK** on Patents sent free. Oldest agency for securing patents.

Patents taken through Munn & Co. receive special notice, without charge, in the

Scientific American.

A handsomely illustrated weekly. Largest circulation of any scientific journal. Terms, \$3 a year; four months, \$1. Sold by all newsdealers.

MUNN & Co. 381 Broadway, New York
Branch Office, 626 F St., Washington, D. C.

Garden and Farm Tools and Implements

To do good farming you must have up to date tools to work with. We carry a most complete line of everything needed by the small or large farmer, from the smallest hand trowel to the largest cane plow. We also have a good assortment of Hand, Bucket or Barrel Sprayers. Our assortment of Hoes, Shovels, Spades, Mattocks, Rakes, Garden Shears, Lawn Mowers, Garden Hose, and other things that are needed daily about the farm or garden, is most complete and our stock large.

E. O. HALL & SON, LTD.

Hawaiian Gazette Co.

LIMITED

Publishers of

THE ADVERTISER

a morning newspaper that
is read by worth-while people
and others.

Subscription, \$1.00 per month

DAILY and SUNDAY

INVEST NOW

IN A COPY OF

PROF. J. F. ROCK'S

"Indigenous Trees of the Hawaiian
Islands"

YOU CAN'T MAKE MONEY FASTER

FOR SALE AT ALL BOOK STORES

**HAWAIIAN GAZETTE CO.,
PUBLISHERS.**

Honolulu, T. H.



OFFICERS AND STAFF OF THE BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY.

(1916)

COMMISSIONERS.

Arthur H. Rice, *President*
Walter M. Giffard J. M. Dowsett
H. M. von Holt

DIVISION OF FORESTRY.

Charles S. Judd, *Superintendent of Forestry and Chief Fire Warden; also Executive Officer of Board.*
David Haughs, *Forest Nurseryman.*
Joseph F. Rock, *Consulting Botanist.*
Bro. Matthias Newell, *in charge of Sub-Nursery at Hilo, Hawaii.*
Walter D. McBryde, *in charge of Sub-Nursery at Homestead, Kauai.*
David Kapihe, *Forest Ranger for Tantalus.*
E. H. Hipple, *Forest Ranger for Palolo, Manoa, and Nuuanu.*
John Pililaa, *Forest Ranger for Waianae.*
Kaina D. Lovell, *Forest Ranger for Kauai.*

DIVISION OF ENTOMOLOGY.

Edward M. Ehrhorn, <i>Superintendent of Entomology and Chief Plant Inspector.</i>		
D. B. Kuhns, <i>Assistant Plant Inspector.</i>		
David T. Fullaway, <i>Field Entomologist.</i>		
Bro. M. Newell, <i>Fruit and Plant Inspector, Hilo, Hawaii.</i>		
E. E. Madden,	} <i>Honorary Plant Inspector at</i>	<i>Mahukona, Hawaii</i>
E. R. Bivens,		<i>Kahului, Maui.</i>
W. D. McBryde,		<i>Koloa, Kauai.</i>
Dr. W. B. Deas,		<i>Hana, Maui.</i>
Capt. C. F. Turner,		<i>Kaanapali, Maui.</i>
G. C. Munro,		<i>Manele, Lanai.</i>

DIVISION OF ANIMAL INDUSTRY.

Victor A. Nørgaard, *Superintendent of Animal Industry and Territorial Veterinarian.*
L. N. Case, *Assistant Territorial Veterinarian.*
H. B. Elliot, *Deputy Territorial Veterinarian for Hawaii.*
J. C. Fitzgerald, *Deputy Territorial Veterinarian for Maui.*
A. R. Glaisyer, *Deputy Territorial Veterinarian for Kauai.*

DIVISION OF HYDROGRAPHY.

G. K. Larrison, *Superintendent of Hydrography.*
R. C. Rice, *Office Engineer.*
H. A. R. Austin, *Junior Engineer.*
C. T. Bailey, *Assistant Engineer.*
R. D. Klise, *Assistant Engineer.*
W. V. Hardy, *Assistant Engineer.*
D. E. Horner, *Field Assistant.*
J. Kaheaku, *Computer.*
E. E. Goo, *Clerk.*

CLERICAL STAFF.

Mrs. C. L. Seybolt, *Clerk and Stenographer.*
Mrs. E. U. Kuhns, *Librarian and Stenographer.*
Daniel Logan, *Editor of the Forester.*

Board of Agriculture and Forestry

PUBLICATIONS FOR DISTRIBUTION.

The Board of Commissioners issues for general distribution to persons in the Territory, annual reports, bulletins, circulars, copies of its rules and regulations, and other occasional papers, which may be had, free, upon application.

A complete list of the publications of the Board available for distribution (together with the titles of certain issues now out of print) is to be found on the cover of the last biennial report.

Applications for publications should be addressed to the Mailing Clerk, P. O. Box 207, Honolulu, Hawaii.

DIVISION OF HYDROGRAPHY.

Rooms 17-22 Kapiolani Bldg. Tel. No. 3662.

The Division of Hydrography has on hand free publications relative to the water resources of the Hawaiian Islands. These publications furnish detailed data as to daily, monthly, mean, maximum, and minimum run-off of streams and ditches, and also cuts and maps pertaining to the different islands. These publications will be mailed free of charge on request.

The records and maps of this division are available for inspection by any one who desires information relative to water resources, topography, etc. Blue print copies of hydrographic data relative to any stream, ditch, spring, etc., which may be under observation by this division will be mailed free of charge on request.

G. K. LARRISON,
Superintendent of Hydrography.